Attachment 2

Literature Review to Support OU 10-04
GIS Mapping and Analyses

October 199

Distribution and Abundance of Mammals, Reptiles, and Birds on the Idaho National Engineering Laboratory

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TABLES

Distribution and Abundance of Mammals, Reptiles, and Birds on the Idaho National Engineering Laboratory

1. INTRODUCTION

The Idaho National Engineering and Environmental Laboratory (INEEL) is a Department of Energy (DOE) facility as defined by Section 101(9) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601(9). This site is located approximately 50 kilometers west of Idaho Falls, Idaho and encompasses 2,305 square kilometers of sagebrush shrub-steppe rangeland. The climate of the INEEL consists of hot, dry summers and cold winters with low total precipitation. The average annual temperature is 5.6EC. Annual precipitation averages 22.4 cm, about 35% of which falls between April and June (Reynolds and Fraley 1989). Over the past several decades, scientists studying the INEL have observed approximately 677 species on the INEL (Table 1).

On November 21, 1989, the INEL was listed by the U.S. Environmental Protection Agency (EPA) to the National Priorities List (NPL). In December 1988, the EPA directed that "thorough and consistent" ecological assessments should be performed at all Superfund sites (EPA 1988). This directive was based on the language in CERCLA mandating remediation of hazardous waste sites to protect human health, as well as the environment (VanHorn et al. 1995).

This study was conducted to compile information on (a) what species utilize the INEEL, (b) the abundance of these species, and (c) the distribution of these species. Species distribution and abundance data collected by the Environmental Science and Research Foundation and its associates, over a twenty year period, were examined for this study. Emphasis was given to Threatened, Endangered, Category 2, small mammal, and big game species initially. Data on the breeding birds of the INEEL as well as other species were later compiled in the report. Once this information was compiled, it was added to a Geographic Information System (GIS) database that already existed. The purpose was to provide data to calculate a site-wide population estimate of the species using the INEEL. Population estimates provide valuable input for performance at the INEEL.

Table 1. Estimated number of species in different taxonomic groups, which have been observed on the INEL as of 1994.[a]

TAX A	Number of Species
Plants	406
Fishes	9
Amphibians	2
Reptiles	10
Birds	204
Mammals	46

a. Personal communication with Randall C. Morris, Ph.D., Environmental Science and Research Foundation, Idaho Falls, ID.

2. METHODS

The Foundation, a contractor of the Department of Energy, and its university faculty affiliates, have conducted much of the ecological research on the INEEL. In 1994, the Foundation published a listing of 345 articles about studies done on the INEEL (Morris 1994). This publication was the basis of the literature base for this study. Appendices A and B of this study contain the citation information from all of the articles examined.

An initial planning meeting was conducted to determine the parameters to be used in the evaluation of each article in the literature base. The following information was collected from each article: location of the study site (latitude/longitude or universal transverse mercator [UTM]), how the location was identified (UTM, latitude/longitude, distance, map coordinants, or general description), abundance of each species of concern (male, female, juvenile, unknown), habitat type described for the study, vegetation class associated with the study site (as referenced from the INEEL vegetation map) (Anderson et al. 1996), and miscellaneous information (information that provided other data that may support population estimates, habitat correlation, distribution and abundance, possible species relocation sites, etc.). The categories were based upon whether the data could be compiled and displayed (overlaid with other data to build a GIS map for species abundance and distribution throughout the INEEL). Once the categories were determined, they were entered into a spreadsheet in Microsoft Excel 4.0. The spreadsheet template is presented in Appendix C.

Each article from the literature base was thoroughly examined for its content. If the article contained a location, number of organisms sighted, and the surrounding habitat it was referenced and used in the report. The majority of the 345 articles were deficient in one or more of these categories and could not be used. Any article not used in the report is referenced in Appendix A along with a brief explanation why it was discarded.

Numerous studies are being conducted on and around the INEEL today by the Foundation and its affiliates. A few of the studies pertain to the species of interest in our report. Personal contact with five of the researchers conducting these studies have been referenced in the article under Appendix A. These studies contain raw, unpublished data. The Foundation requested this information from their university researchers under the terms of the letter in Appendix D. Permission to use these studies was obtained in each case. Other studies that dealt directly with the species of concern were not used due to various reasons.

The initial phase of the literature base compilation was a literature search of the files at the Foundation. Articles found to contain relevant information and able to be used in the GIS mapping system were incorporated. The next phase was to contact the university affiliates and obtain permission to incorporate their data into the study. The final phase was a search of other data bases. A search of the Idaho State University library was conducted. The limited search commands and huge data base made it impossible to obtain information to be used in the project in the amount of time available. If proper time is allotted a thorough search of the library could reveal data that would allow estimates of the abundance and distribution of species in other sagebrush steppe areas.

3. RESULTS AND RERAMMENDATIONS

3.1 Results

The citation data base started with 345 articles on a variety of subjects and organisms. Several of the articles were about species that were of no interest to this project. Those articles are listed under Appendix B. The remaining articles were sorted and incorporated, if the data were within the parameters specified for the GIS mapping system as defined in Section 2 of this report. Most articles gave general site-wide locations for their studies and we could not use them. Other articles gave specific locations, but not populations or only gave information that was pertinent to their study. The final tally of articles used from the original data base was 22 (6 personal contacts have also been included in the report). Those species of interest that have been cited in the report appear in a species list in Appendix E.

3.2 Recommendations

There are several articles used in the report that date back as far as 1976. Several fires and other natural as well as man-made disturbances have altered the INEEL. These data, while valuable, may not give accurate abundance and distribution for current conditions. In thc past, no specific guidelines were used for properly documenting a site for use in determining abundance and distribution of a species on the INEEL. If future data are to be used for GIS mapping and ecological risk assessment, it would be in the best interest of the DOE and its contractors to develop a uniform set of parameters. This would allow easier mapping and be cost saving, eliminating rework of studies that were nonspecific in their data collection. Documentation for species under study should include the following:

- GPS location
- Habitat characteristics (reference to INEEL vegetation map; Anderson et al. 1996)
- Abundance
- Sex and age
- Study date
- General site location (ex. 1 mile SSW of Test Reactor Area [TRA]).

The data gathered from these reports was used to produce the GIS maps for species abundance and distribution. However, because of the limited number of articles used and the lack of research on most species, the data must be interpreted carefully. Some species distribution and abundance information relies wholly on one article that may have been done 20 years ago. More data should be collected for this typc of project in the future for a more accurate portrayal of a species abundance and population.

LITERATURE CITED

Anderson, J. E., K. T. Ruppel, J. M. Glennon, K. E. Holte, and R. C. Rope, 1996, Plant Communities, Ethnoecology, and Flora of the Idaho National Engineering Laboratory. Environmental Science and Research Foundation (ESRF-005), Idaho Falls, ID.

EPA, 1988, *Joint Memorandum of the Office of Emergency and Remedial Response and the Office of Waste Programs Enforcement.*

Morris, R. C., 1996, INEL Biodiversity information from 1994. Personal contact. Idaho Falls: Environmental Science and Research Foundation.

Morris, R. C., 1994, Radioecology and Ecology Publications of the Idaho National Engineering Laboratory: 1974–1994. Environmental Science and Research Foundation (ESRF-003), Idaho Falls, ID.

Reynolds, T. D. and L. Fraley, Jr., 1989, Root Profiles of Some Native and Exotic Plant Species in Southeastern Idaho. *Environmental and Experimental Botany*, 29: 241–248.

VanHorn, R. L., N. L. Hampton, and R. C. Morris, 1995, *Guidance Manual for Conducting Screening Level Ecological Risk Assessment at the INEL.* Prepared for the U.S. Department of Energy, Assistant Secretary for the Office of the Environmental Management Under DOE Idaho Operations Office. Contact DE-AC07-94IDI3223.

Appendix A

Appendix A

A1. SUMMARY OF ARTICLES CITED

Arther, W.J., O.D. Markham, C.R. Groves, and B.L. Keller, 1987, Radionuclide Export by Deer Mice at a Solid Radioactive Waste Disposal Area in Southeastern Idaho, *Health Phy,* 52:45–53.

Concentrations of radionuclides present in deer mice tissue collected from the radioactive waste management complex were significantly higher than those from a control area. It was determined that deer mice are a mode of radionuclide uptake and transport, but it seems unlikely that this would have any adverse environmental consequences. This study was conducted in 1979.

Boone, J.D., 1990, Ecological characteristics and preferential edge use of small mammal populations inhabiting a radioactive waste disposal area. M.S. Thesis. Pocatello: Idaho State University, p. 101.

Small mammals on the Radioactive Waste Management Complex (RWMC) were live-trapped and coated with florescent pigments from May 1988–September 1989 to follow their movements. Populations in crested wheatgrass appeared to be more stable than those in native sagebrush. Density was highest around the edge habitat.

Bosworth, W.B., 1994, Characteristics of wintering activity in Plecotus townsendii in southeastern Idaho. M.S. Thesis. Pocatello: Idaho State University, p. 74.

Plecotus townsendii was observed in the Rattlesnake Cave Complex from November 1992–May 1993. The energy budgets were examined during the winter months. Flight frequency and site relocation rates were used to determine activity and its effect on space. Effects of disturbance and handling of the bats was also measured.

Cieminski, K.L., 1993, Wildlife use of wastewater ponds at the Idaho National Engineering Laboratory. M.S. Thesis. Brooking: South Dakota State University, p. 311.

Several species of birds and mammals were recorded at seven different ponds on the INEL from 1985-1991. Pond nutrients and heavy metals were sampled to determine if they exceeded EPA regulations and thus cause the species harm.

Filipovich, M.A., 1983, Small mammal density, movement, and food habits on the SL-1 radioactive-waste disposal area, Idaho National Engineering Laboratory. M.S. Thesis. Pocatello: Idaho State University, p. 60.

Small mammals were studied from Aug. 1981–June 1982 on the RWMC. Species composition, density, and movement patterns were measured using mark-release methods. The diets of the organisms along with their habitats were observed.

Genter, D.L., 1986, Wintering bats of the upper snake river plain: occurrence in lava-tube caves, *Great Basin Natur.*, 46:241–244.

Over 30 lava-tube caves were studied site-wide from December 12,1984–January 27,1985 to determine the distribution and habitat selection of wintering bats. Perch location during hibernation, depth of the perch locations within the cave, and temperature were monitored. Temperature was the limiting factor in habitat selection.

Gleason, R.S. and D.R. Johnson, 1985, Factors influencing nesting success of burrowing owls in southeastern Idaho, *Great Basin Natur.*, 45:81–84.

A small population of owls, 13–14 pairs, was discovered from May 21, 1976–October 1, 1977 throughout the site. They utilized old badger burrows and natural cavities. Food sources were studied to determine if it was the limiting factor. The population was tied to brood size and dietary factors influenced by three species of rodents that experienced a decrease in 1977.

Groves, C.R. and B.L. Keller, 1986, Movements by Small Mammals on a Radioactive Waste Disposal Area in Southeastern Idaho, *Great Basin Natur.*, 46:404–410.

Small mammals were trapped over a 15-month period between May 1978 and July 1979 on a low-level radioactive waste disposal area to determine their average linear movement. The linear movement within habitats ranged from 20 to 70 m for all of the species trapped.

Groves, C.R. and B.L. Keller, 1983, Ecological characteristics of small mammals on a radioactive waste disposal area in southeastern Idaho, *Amer. Midl. Natur.*, 109:253–265.

Small mammals were examined around the RWMC from May 1978–July 1979. Species composition, diversity, biomass and densities in differing vegetative communities were studied for several mammal populations. 2384 individuals were live-trapped with the largest species diversity found in the sagebrush community.

Guyer, C. and A.D. Linder, 1985, Growth and population structure of the short-horned lizard (*Phrynosoma douglassi*) and the sagebrush lizard (*Sceloporus graciosus*) in southeastern Idaho, *Northwest Sci.* 59:294–303.

The short-horned lizard and the sagebrush lizard were studied site-wide from 1976–1977. Three age classes were assigned per species with densities of 14 individuals per 1 ha. grid. Size, survival, and reproductive effort were examined.

Halford, D.K., 1987, Density, movement, and transuranic tissue inventory of small mammals at a liquid radioactive waste disposal area. pp. 147–156, In: J.E. Pinder, III, J. J. Alberts, K.W. Mcleod, and R.G. Schreckhise (eds.). Environmental Research on Actinide Elements. CONF-841142 (DE86008713). November 7–11, 1983. Hilton Head, SC. Washington DC: U.S. Department of Energy, Office of Health and Environmental Research.

Several small mammals were monitored from August 4–September 4,1981 on the RWMC for linear movement, density, and transuranic radionuclide inventory. It was found that about 1/3 of the transuranics inventoried could be removed by small mammals during the summer of 1981.

Hansen, R.W, 1994, Raptor Use of the Idaho National Engineering Laboratory. M.S. Thesis. Brooking: South Dakota State University, p. 141.

This study was conducted on the INEL between 1991-1993 to assess the effects of human activity on raptors. Various sampling techniques including road-side raptor surveys, transects, nocturnal calling surveys, and nest monitoring were used to evaluate raptor use of the INEL.

Johnson, M.J., 1982, Response of small mammals to Livestock Grazing in Southcentral Idaho, *J. Range Manage,* 35: 51–53.

This study compared indices of small mammal abundance among 25 different grazed areas on the INEL. This study was conducted in 1977.

Koehlor, D.K. and S.H. Anderson, 1991, Habitat use and Food Selection of Small Mammals Near a Sagebrush/Crested Wheatgrass Interface in Southeastern Idaho, *Great Basin Natur.*, 51: 249–255.

Four species of small mammals were monitored near a sagebrush/crested wheatgrass interface to determine habitat use and food selection patterns. This study was conducted from June to August 1984.

Koehler, D.K., T.D. Reynolds and S.H. Anderson, 1987, Radio-transmitter implants in 4 species of small mammals, *J. Wildl. Manage,* 51:105–108.

Four species of small mammals were fitted with radio-transmitters and monitored from 1982–1985 around the RWMC. The transmitter neither impaired locomotion nor the individuals behavior. The technique appears to have provided a viable means of tracking semifossorial species.

Mullican, T.R., 1986, Additional records of *Sorex merriami* from Idaho, *Murrelet* 67:19–20.

Shrews were collected site-wide and in the Great Basin area from June 1983–August 1984 and compared. The study provided specimens that suggest the shrew may be found throughout the Snake River Plain and providing evidence of the continuity in distribution in the Great Basin area.

Mullican, T.R. and B.L. Keller, 1986, Ecology of the sagebrush vole (*Lemmiscus curtaus*) in southeastern Idaho, *Can. J. Zool.*, 64:1218–1223.

The sagebrush vole was studied on and around the RWMC from January 1982–March 1983. Density, weight, and whether the voles occurred in pairs were examined over the 13-month period. Average density ranged from 4 to 16/ha. Food habitat analysis was conducted during the study.

Petersen, K.L. and L.B. Best, 1987, Effects of prescribed burning on nongame birds in a sagebrush community, *Wild. Soc. Bull.*, 15:317–329.

Several species of birds located 11 km south of Howe on the INEL were studied from 1980-1985. In burned plots an additional species was observed compared to control plot experienced one less species. Incomplete, mosaic burns were determined not to be detrimental to nonbird game species.

Reynolds, T.D. and C.H. Trost, 1981, Grazing, crested wheatgrass, and bird populations in southeastern Idaho, *Northwest Sci.*, 55:225–234.

Various bird species were studied around the southern boundary of the INEL and around Central Facilities Area (CFA) from 1976–1977. Nesting and nonnesting birds diversity and density were compared on sheep grazed land and ungrazed land. Most species preferred the sagebrush habitat to crested wheatgrass.

Reynolds, T.D. and C.H. Trost, 1980, Response of native vertebrate populations to crested wheatgrass planting and grazing by sheep, *J. Range Manage.*, 33:122–125.

Birds, reptiles, and small mammals were studied around the southern boundary of the INEL and around CFA from January 1976–February 1977. Species diversity and relative density were examined in ungrazed and grazed habitats supporting crested wheatgrass. Results indicated that numbers of

individuals decreased with the planting of crested wheatgrass in place of sagebrush. There was little or no difference between ungrazed and grazed habitats.

Reynolds, T.D, 1979, Response of Reptile Populations to Different Land Management Practices on the Idaho National Engineering Laboratory Site, *Great Basin Natur.*, 39:255–262.

This study looked at the population of reptiles of the INEL that were either dominated by crested wheatgrass or sagebrush. The sagebrush lizard and the short-horned lizard were the only species encountered in suitable numbers to perform statistical analysis. It was observed that both species preferred sagebrush habitat to crested wheatgrass. This study was conducted from May to October of 1977.

Wackenhut, M.C., 1990, Bat Species Overwintering in Lava-tube Caves in Lincoln, Gooding, Blaine, Bingham and Butte Counties, Idaho with special reference to Annual Return of Banded *Plecotus townsendii*. M.S. Thesis. Pocatello: Idaho State University, p. 64.

This study focused on bat species composition and local distribution in Idaho, determining the status of wintering bat populations, and tracking the movements of banded bats. The study was conducted between June 1987–February 1990.

Wilde, D.B, 1981, Pygmy rabbit reproduction: possible modifications by drought conditions, pp. 559–571, In: K. Myers and C.D. MacInnes (eds.). Proceedings of the World Lagomorph Conference held at Guelph, Ontario, August 1979, University of Guelph, Canada.

This study took place on two locations on the INEL from 1975–1977. Live-trapping produced 312 different rabbits captured, the majority being female. The onset of reproduction was believed to be photoperiod for males and vegetation condition for females.

H8-1.5 A2. PERSONAL CONTACT CITATIONS

Beaver, D., 1996, Unpublished Mule Deer Sighting Data 1995-1996. Personal Contact.

No background information was given on this study. Data tables were provided with the following information: mule deer identification number, UTM (easting and northing), number in group, activity, and miscellaneous information. No habitat information was given.

Belthoff, J., 1996, Unpublished Breeding Birds Survey Data from 1985–1991 and 1994–1996. Personal Contact. Boise: Boise State University.

The route information from the Breeding Birds Survey (BBS) of 1985-1991 was entered in the GIS database prior to this study. The data tables from the BBS had been compiled, but needed to be reformatted to be put into the GIS. Dr. Belthoff provided the raw data from three years of surveying that had been conducted since 1991. None of the BBS data contained habitat information.

Knick, S, 1996, Unpublished Bobcat Telemetry Data from 1982-1985. Personal Contact. Boise: Boise State University.

No background information was given on this study. Data tables were provided that included the following information: identity number of bobcat, date of telemetry collection, time of sighting, UTM (casting and northing) coordinates, and sex of bobcat. No habitat information was given.

Reynolds, T.D., 1996, Unpublished Pronghorn Antelope Telemetry. Personal contact. Idaho Falls: The Environmental Science and Research Foundation.

Data tables were provided that included UTM easting, UTM northing, and number of individuals observed. The species of interest was the pronghorn antelope. No habitat information was given.

Sehman, R.W. and S. Copper, 1996, Unpublished Sagebrush Lizard Telemetry Data From 1975–1996. Personal contact. Pocatello: Idaho State University.

Data tables were provided that included the following information: siting number, common name, genus, species, number observed, age/stage, sex, date observed, time, name of observer, affiliation, address, phone number, animal's location (verbal description), UTM easting, UTM northing, accuracy (meters), county, state, country, habitat description, weather, remarks.

Warren, R.W., 1996, Unpublished Big Game Telemetry Data. Personal Contact. Idaho Falls: The Environmental Science and Research Foundation.

Data tables were provided that included UTM easting, UTM northing, and number of individuals observed. The big game species that were observed included, elk, mule deer, and pronghorn antelope. No habitat information was given.

KEY	Author	Title	Animal	Data Entered	Referenced	Permission
321	Bosworth, W.R	Characteristics of winter activity in Plecotus townsendii in south eastern Idaho.	bat	yes	yes	yes
293	Koehler, D.K. and S.H. Anderson	Habitat use and food selection of small mammals near a sagebrush/crested wheatgrass interface in southeastern Idaho	small mammals	yes	yes	yes
278	Wackenhut, M.C.	Bat species overwintering in lava-tube caves in Lincoln, Gooding, Blaine, Bingham and Butte Counties, Idaho with special reference to annual return of banded Plectus townsendii.	bats	yes	yes	yes
277	Boone, J.D.	Ecological characteristics and preferential edge use of small mammal populations inhabiting a radioactive waste disposal area.	small mammals	yes	yes	yes
242	Halford, D.K.	Density movement, and transuranic tissue inventory of small mammals at a liquid radioactive waste disposal area.	small mammals	yes	yes	yes
219	Koehler, D.K., T.D. Reynolds and S.H. Anderson	Radio-transmitter implants in 4 species of small mammals.	Small mammals	yes	yes	yes
218	Arthur, W.J., O.D. Markham, C.R. Groves, and B.L. Keller	Radionuclide export by deer mice at a solid radioactive waste disposal area in Southeastern Idaho.	deer mice	yes	yes	yes
215	Mullican, T.R. and B.L. Keller	Ecology of the sagebrush vole	sage vole	yes	yes	yes
214	Genter, D.L.	Wintering bats of the upper Snake River Plain: occurrence in lava-tube caves	bats	yes	yes	yes
212	Mullican, T.R.	Additional records of *Sorex merriami* from Idaho.	Merriam's shrew	yes	yes	yes
190	Groves, C.R. and B.L Keller	Movements by small mammals on a radioactive waste disposal area in Southeastern Idaho.	small mammals	yes	yes	yes
139	Filipovich, M.A.	Small mammal density, movement, and food habits on the SL-1 radioactive-waste disposal area, Idaho National Engineering Laboratory.	small mammals	yes	yes	yes
131	Groves, C.R and B.L. Keller	Ecological characteristics of small mammals on a radioactive waste disposal area in Southeastern Idaho.	small mammals	yes	yes	yes
105	Johnson, M.K.	Response of small mammals to livestock grazing in southcentral Idaho.	small mammals	yes	yes	yes
89	Reynolds, T.K. and C.H. Trost	Grazing, crested wheatgrass, and bird populations in southeastern Idaho.	small mammals	yes	yes	yes

KEY	Author	Title	Animal	Data Entered	Referenced	Permission
68	Reynolds, T.D. and C.H. Trost	The response of native vertebrate populations to crested wheatgrass planting and grazing by sheep		yes	yes	yes
319	Hansen, R.W.	Raptor use of the Idaho National Engineering Laboratory	birds	yes	yes	yes
311	Cieminski, K.L.	Wildlife use of wastewater ponds at the Idaho National Engineering Laboratory	birds	yes	yes	yes
244	Petersen, K.L. and L.B. Best	Effects of prescribed burning on nongame birds in a sagebrush community	birds	yes	yes	yes
165	Gleason, R.S. and D.R. Johnson	Factors influencing nesting success of burrowing owls in southeastern Idaho	birds	yes	yes	yes
178	Guyer, C. and A.D. Linder	Growth and population structure of the short-horned lizard (Phrynosoma douglassi) and the sagebrush lizard (Sceloporus graciosus)	reptiles	yes	yes	yes
41	Reynolds, T.D.	Response of the reptile populations to different land management practices on the Idaho National Engineering Laboratory Site	reptiles	yes	yes	yes
85	Wilde, D.B.	Pygmy rabbit reproduction:possible modification by drought conditions.	pygmy rabbit	yes	yes	yes
	Knick, S.	personal contact-Bobcat Telemetry data	mammals	yes	yes	yes
	Belthoff, J.	personal contact-Breeding Birds Survey data	birds	yes	yes	yes
	Warren, R.	personal contact-Big Game Telemetry	mammals	yes	yes	yes
	Sehman, J. and S. Cooper	personal contact-Sagebrush lizard data	reptiles	yes	yes	yes
	Beavers, D.	personal contact-Mule deer data	mule deer	yes	yes	yes
	Reynolds, T.D.	personal contact-Pronghorn antelope data	pronghorn antelope	yes	yes	yes

Appendix B

Appendix B

Birds

318. Morris, R. C., 1993, The implications of lined radioactive waste ponds for waterfowl contamination. pp. 147–155, In: R. L. Kathren, D. H. Denham, and K. Salmon (eds.). Environmental health physics: proceedings of the 26th mid-year topical meeting of the Health Physics Society. Richland, WA: Columbia Chapter of the Health Physics Society.

302. Clark, W. H. and P. E. Blom, 1992, Sage Thrasher, *Oreoscoptes montanus* (Townsend), predation on a mating swarm of the harvester ant, *Pogonomyrmex salinus* Olsen, *J. Idaho Acad. Sci.*, 28: 29–32.

295. Peterson, K. L. and L. B. Best, 1991, Nest-site selection by sage thrasher in southeastern Idaho, *Great Basin Natur.*, 51:261–266.

288. Sime, C. A., 1991, Sage grouse use of burned, non-burned, and seeded vegetation communities on the Idaho National Engineering Laboratory, Idaho. M. S. Thesis. Bozeman: Montana State University, p. 72.

273. Millard, J. B., F. W. Whicker and O. D. Markham, 1990, Radionuclide uptake and growth of barn swallows nesting by radioactive leaching ponds, *Health Phys.*, 58:429–439.

268. Howe, F. P. and L. D. Flake, 1989, Mourning dove use of man-made ponds in a cold desert ecosystem in Idaho, *Great Basin Natur.*, 49:627–631.

262. Howe, F. P. and L. D. Flake, 1989, Nesting ecology of mourning doves in a cold desert ecosystem, *Wilson Bull.*, 101: 467–472.

252. Markham, O. D., D. K. Halford, S. K. Rope and G. B. Kuzo, 1988, Plutonium, Am, Cm and Sr in ducks maintained on radioactive leaching ponds in southeast Idaho, *Health Phys.*, 55: 517–524.

251. Howe, F. P. and L. D Flake, 1988, Mourning dove movements during the reproductive season in southeastern Idaho, *J. Wildl. Manage.*, 52:477-480.

250. Craig, E. H., T. H. Craig and L. R. Powers, 1988, Activity patterns and home-range use of nesting long-eared owls, *Wilson Bull.*, 100:204-213.

248. Moritz, W. E, 1988, Wildlife use of fire-disturbed areas in sagebrush steppe on the Idaho National Engineering Laboratory. M. S. Thesis. Bozeman: Montana State University, p. 135.

247. Connelly, J. W., H. W. Browers and R. J. Gates, 1988, Seasonal movements of sage grouse in southeastern Idaho, *J. Wildl. Manage.*, 52:116-122.

240. Petersen, K. L. and L. B. Best, 1987, Territory dynamics in a sage sparrow population: Are shifts in site use adaptive?, *Behav. Ecol. and Sociobiol.*, 21:351-358.

226. Laundré, J. W., T. D. Reynolds, S. T. Knick and I. J. Ball, 1987, Accuracy of daily point relocations in assessing real movements of radio-marked animals, *J. Wildl. Manage.*, 51:937-940.

222. Halford, D. K, 1987, Effect of cooking on radionuclide concentrations in waterfowl tissues, *J. Envir. Radioact.*, 5:229-233.

221. Powers, L. R. and M. J. Wheeler, 1987, Brewer's blackbird feeding on a barn swallow, *Wilson Bull.*, 99:294-295.

217. Peterson, K. L., 1986, Avian ecological studies in a sagebrush community: Bird responses to fire and territory dynamics in a sparrow population. Ph. D. Dissertation. Ames: Iowa State University, p. 97.

210. Craig, E. H., T. H. Craig and L. R. Powers, 1986, Habitat use by wintering golden eagles and American rough-legged hawks in southeastern Idaho, *J. Raptor Res.*, 20:69-71.

208. Petersen, K. L., L. B. Best and B. M. Winter, 1986, Growth of nestling sage sparrows and Brewer's sparrow, *Wilson Bull.*, 98:535-546.

207. Petersen, K. L. and L. B. Best, 1986, Diets of nestling sage sparrows and Brewer's sparrows in an Idaho sagebrush community, *J. Field Ornithol.*, 37:283-294.

202. Reynolds, T. D., J. W. Connelly, D. K. Halford and W. J. Arthur, 1986, Vertebrate fauna of the Idaho National Environmental Research Park, *Great Basin Natur.*, 46:513-527.

202. Reynolds, T. D., J. W. Connelly, D. K. Halford and W. J. Arthur, 1986, Vertebrate fauna of the Idaho National Environmental Research Park, *Great Basin Natur.*, 46:513-527.

198. Arthur, W. J. and D. H. Janke, 1986, Radionuclide concentrations in tissues of wildlife occurring at a solid radioactive waste disposal area, *Northwest Sci.*, 60:154-159.

196. Browers, H. W. and J. W. Connelly, 1986, Capturing sage grouse with mist nets, *Prairie Natur.*, 18:185-188.

193. Howe, F. P., 1986, An ecological study of mourning doves in a cold desert ecosystem on the Idaho National Engineering Laboratory. M. S. Thesis. Brookings: South Dakota State University, p. 66.

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BIRDS

319. Referenced in project

318. No specific locations given

311. Referenced in project

302. No mention of species of interest

273. No mention of species of interest

250. No mention of species of interest

244. Referenced in project

240. No mention of species of interest

210. No mention of species of interest

208. No mention of species of interest

207. No mention of species of interest

202. Abundance and location insufficient for project

196. No locations given

191. No mention of species of interest

186. Only a mention of the species of interest

185. Only a mention of the species of interest

181. No mention of species of interest

180. No mention of species of interest

177. Only two specific broods studied without locations given

172. No locations given

171. No mention of species of interest

169. Only a mention of the species of interest

168. No mention of species of interest

167. Species of interest were found as prey remains in nests

166. No abundance or location given

165. Referenced in project

154. No abundance or location given

149. Site-wide location given not specific enough for project

133. No abundance or locations given

124. No specific abundance given at each site, one total abundance for all sites

120. No mention of species of interest

79. No locations given, only site-wide

75. No mention of species of interest

71. No abundance or location given

68. Abundance given but no specific locations

65. No abundance or location given

50. No distinction between species in the total numbers given

49. No location given

47. Location and abundance information not specific enough

46. Species of interest were found as prey remains in nests

43. No mention of species of interest

36. No mention of species of interest

35. No mention of species of interest

23. Abundance too general

19. No abundance or location given

15. No location given

10. No location given

7. No location given

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MAMMALS

321. Referenced in project

314. Article not found

313. Number of burrows given but no abundance given

310. Abundance information unclear and appears to contradict itself

311. Referenced in project

305. No mention of species of interest

301. Article not found

293. Referenced in project

290. No mention of species of interest

278. Referenced in project

277. Referenced in project

274. Only a mention of the species of interest

269. Offsite boundaries

267. Location information site-wide, too general

264. Location information site-wide, too general

257. Information in this article is contained in another article

248. Article not found

246. No abundance given

242. Referenced in project

241. No mention of species of interest

239. Article not found

230. No abundance or location given

229. No abundance information given

226. No mention of species of interest

225. No mention of species of interest

223. No abundance or location given

219. Referenced in project

218. Referenced in project

215. Referenced in project

214. Referenced in project

209. No mention of species of interest

204. No total abundance figures given

202. No abundance or location

202. Location and abundance too general

201. No abundance information given

199. No abundance information given

198. Only a mention of species of interest

190. Referenced in project

184. No abundance information given

183. No abundance information given

182. No abundance information given

176. No mention of species of interest

175. Study contains no pertinent information

173. Only specific organisms tagged and monitored, no total abundance given

162. Species of interest listed only as total bone mass

162. Study species found only in remains

159. No mention of species of interest

155. Study did not contain pertinent information

154. Study did not contain pertinent information

153. No abundance given

150. No mention of species of interest

149. No mention of species of interest

147. No mention of species of interest

144. Article not found

143. No specific location given

139. Referenced in project

137. No mention of species of interest

136. Study did not contain pertinent information

135. No specific location given

131. Referenced in project

129. Location information site-wide, too general

126. No abundance information given

122. Article not found

119. Study did not contain pertinent information

114. No mention of species of interest

113. Species of interest grouped into one giant category for abundance

113. Study did not contain pertinent information

110. Study did not contain pertinent information

109. No mention of species of interest

105. Number of burrows or tracks given but no actual abundance of organisms given

104. No abundance information given

102. Article not found

100. No abundance given

99. No abundance information given

96. Article not found

94. Article not found

93. No abundance information given

90. No abundance information given

89. Referenced in project

88. Article not found

85. Referenced in project

82. No mention of species of interest

76. No abundance information given

74. Article not found

72. No abundance information given

71. Study did no contain any pertinent information

70. No mention of species of interest

69. Article not found

68. Location unspecific

67. No abundance information given

66. No specific location given

63. Article not found

62. No abundance information given

61. No mention of species of interest

60. Study contained no pertinent information

59. Article not found

58. No abundance given

57. Study did not contain pertinent information

56. No mention of species of interest

53. No abundance information given

52. No mention of species of interest

51. Study contained no pertinent information

50. Study contained no pertinent information

48. Study contained no pertinent information

39. Article not found

38. Article not found

37. No abundance information given

33. Same information given in citation #85

32. No abundance given

31. Study contained no pertinent information

30. Article not found

29. Article not found

28. No mention of species of interest

24. Study did not contain any pertinent information

23. No abundance information given

23. No specific abundance given

21. No abundance information given

18. No abundance information given

17. Article not found

16. Article not found

12. Article not found

11. Abundance numbers not clearly stated

9. Article not found

5. Study contained no pertinent information

4. Article not found

H8-3 REPTILES AND AMPHIBIANS

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REPTILES AND AMPHIBIANS

202. Location not specific enough

198. No mention of species of interest

187. Location not specific enough

178. Referenced in project

154. Location not specific enough

71. Study did not contain pertinent information

68. Abundance but no location given in article

41. Referenced in project

34. Location but no abundance in article

29. Study did not contain pertinent information

26. Article not found

23. Study did not contain pertinent information

22. Study did not contain pertinent information

13. No abundance given

Appendix C

	Common Name	Species Name									
Key	Latitude	Longitude	How Provided	Male	Female	Unknown	Study Date	Habitat	Veg. Class	Uncertainty Information	Miscellaneous Information
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Appendix D

Appendix D

The following is the template form of the letter that was sent out to individuals whose data had not been published at the time this study was being done.

Environmental Science & Research Foundation, Inc.

101 S. Park Ave., Suite 2; P.O. Box 51838 ● Idaho Falls, ID 83405-1838 ● (208)525-7053 ● Fax: (208)525-7036

September 10, 1996

FIELD(Name)
FIELD(Title)
FIELD(Address)

Dear FIELD(Salutation):

The Foundation is compiling data on Threatened and Endangered, former Category 2, and game species which use the Idaho National Engineering Laboratory (INEL). The data will be used in a GIS based evaluation of how these species use the site and its resources. Our goal is to improve Ecological Risk Assessment at the INEL by determining which species are potentially effected by INEL contamination and to what extent.

One of the species groups we are interested in includes FIELD(Species). Your raw data pertaining to location and abundance of this species from your field studies on the INEL would help in our evaluation. The information we would like to compile for this project includes:

- Location of each individual or group of individuals (latitude/longitude, UTM, or township/range).
- Date of each observation.
- Abundance at each site (male, female, juvenile, total population).
- Habitat type.
- Any other information that you feel is relevant to our goals.

Enclosed is a copy of the spreadsheet we are using to compile the data. If you can conveniently provide the data in a similar form, we would be grateful. If the habitat information is unavailable, we would be happy to accept the other information without it.

Please provide this information by e-mail (morrisr@env.esrf.isu.edu) or to the above mailing address. We would appreciate your reply as soon as possible, but no later than September 15, 1996.

Let me assure you that your data will not be published independently. Instead it will be combined with other data sets in a GIS format. Only summaries of all data will be

published and you will receive appropriate acknowledgements. If you have any questions please contact me at (208) 525-7053. Thank you.

Sincerely,

Randall C. Morris, Ph.D.
Radioecologist

Enclosure: As stated

Appendix E

Common Name	Species Name
bobcat	*Lynx rufus*
bushytailed woodrat	*Neotoma cinerea*
deer mouse	*Peromyscus maniculatus*
elk	*Cervus elaphus*
gopher snake	*Pituophis melanoleucus*
great basin pocket mouse	*Perognathus parvus*
least chipmunk	*Eutamias minimus*
Merriam's shrew	*Sorex merriami*
montane vole	*Microtus montanus*
mule deer	*Dama hemionus*
northern grasshopper mouse	*Onychomys leucogaster*
northern pocket gopher	*Thomomys talpoides*
Ord's kangaroo rat	*Dipodoms ordii*
plains milkvetch	*Astragalus ceramicus*
pronghorn antelope	*Antilocapra americana*
pygmy rabbit	*Sylvilagus idahoensis*
sagebrush vole	*Lagurus curtatus*
sagebrush lizard	*Sceloporus graciosus*
short-horned lizard	*Phyrnosoma douglassi*
small footed myotis	*Myotis subulatus*
spreading gilia	*Ipomopsis polycladon*
Townsend's big-eared bat	*Plecotus townsedii*
Townsend's ground squirrel	*Spermophilus townsendii*
western harvest mouse	*Reithrodontomys megalotis*
wing-seeded primrose	*Camissonia pterosperma*

Common Name	Species Name
American avocet	*Recurvirostra*
American coot	*Fulica americana*
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
American widgeon	*Anas americana*
badger	*Tacidea taxus*
Baird's sandpiper	*Calidris bairdii*
bank swallow	*Riparia riparia*
barn swallow	*Hirundo rustica*
Barrow's goldeneye	*Bucephala islandica*
belted kingfisher	*Megaceryle alcyon*
black tern	*Childonias niger*
black-billed magpie	*Pica pica*
black-tailed jackrabbit	*Lepus californicus*
blue-winged teal	*Anas discors*
Bohemian waxwing	*Bombycilla garrulus*
Bonaparte's gull	*Larus philadelphia*
Brewer's blackbird	*Euphagus cyanocephalus*
Brewer's sparrow	*Spizella breweri*
brown-headed cowbird	*Molothrus ater*
bufflehead	*Bucephala albeola*
burrowing owl	*Athene cunicularia*
California gull	*Larus californicus*
Canada goose	*Branta canadenis*
canvasback	*Aythya valisinneria*
cattle egret	*Bubulcus ibis*
chipping sparrow	*Spizella passerina*
cinnamon teal	*Anas cyanoptera*
Clark's grebe	*Aechmophorus clarkii*
cliff swallow	*Hirundo prrrhonta*
common goldeneye	*Bucephala clangula*

Common Name	Species Name
common loon	*Gavia immer*
common merganser	*Mergus merganser*
common nighthawk	*Chordeiles minor*
common poorwill	*Phalaenopilus nuttallii*
common raven	*Corus corax*
common snipe	*Gallinago gallinago*
common yellowthroat	*Geothlypis trichas*
coyote	*Canis latrans*
dark-eyed junco	*Junco hyemalis*
eared grebe	*Podiceps auritus*
eastern kingbird	*Tyrannus tyrannus*
European starling	*Sturnus vulgaris*
ferruginous hawk	*Buteo regalis*
Franklin's gull	*Larus pipixcan*
gadwall	*Anas strepera*
golden eagle	*Aquila chrysaetos*
gray flycatcher	*Empidonax wrightii*
gray partridge	*Perdix perdix*
great blue heron	*Ardea herodias*
greater yellowlegs	*Tringa melanoleuca*
green-winged teal	*Anas crecca*
hooded merganser	*Lophodytes cucullatus*
horned lark	*Eremophila alpestris*
house finch	*Carpodacus mrxicanus*
house sparrow	*Passer domesticus*
house wren	*Troglodytes aedon*
killdeer	*Charadrius vociferus*
Lapland longspur	*Calcarius lapponicus*
lark bunting	*Calamospiza melanocorys*
lazuli bunting	*Passerina amoena*
least sandpiper	*Calidris minutilla*
lesser goldfinch	*Carduelis psaltria*

Common Name	Species Name
lesser scaup	*Aythya affinis*
Lewis' woodpecker	*Melanerpes lewis*
Lincoln's sparrow	*Melospiza lincolnii*
loggerhead shrike	*Lanius ludovicianus*
long-billed dowitcher	*Limnodromus scolopaceus*
long-eared owl	*Asio otus*
MacGillivray's warbler	*Oporonis tolmiei*
mallard	*Anas platyrhynchos*
marsh wren	*Cistothorus palustrus*
mountain bluebird	*Sialia currucoides*
mourning dove	*Zenaida macroura*
muskrat	*Ondatra zibethicus*
northern flicker	*Colaptes auratus*
northern harrier	*Circus cyaneus*
northern pintail	*Anas acuta*
northern rough-winged swallow	*Stelgiddopteryx serripennis*
northern shoveler	*Anas clpeata*
northern shrike	*Lanius excubitor*
Nuttall's cottontail	*Sylvilagus nuttallii*
pied-billed grebe	*Podilymbus podiceps*
porcupine	*Erethizon dorsatum*
prairie falcon	*Falco mexicanus*
raccoon	*Procyon lotor*
red-breasted merganser	*Mergus serrator*
red-necked phalarope	*Phalaropus lobatus*
red-tailed hawk	*Buteo jamaicensis*
red-winged blackbird	*Agelaius phoeniceus*
redhead	*Aythya americana*
ring neck duck	*Aythya collaris*
ring-billed gull	*Larus delawarensis*
ring-necked pheasant	*Phasianus colchicus*
rock dove	*Columba livia*

Common Name	Species Name
rock wren	*Salpinctes obsoletus*
rough-legged hawk	*Buteo lagopus*
ruddy duck	*Oxyura jamaicensis*
sage grouse	*Centrocerus urophasianus*
sage sparrow	*Amphispiza belli*
sage thrasher	*Oreoscoptes montanus*
savannah sparrow	*Passerculus sandwichensis*
Say's phoebe	*Sayornis saya*
short-eared owl	*Asio flammeus*
solitary sandpiper	*Tringa solitaria*
solitary vireo	*Vireo solitarius*
song sparrow	*Melospiza melodia*
sora	*Porzana carolina*
spotted sandpiper	*Actitis macularia*
Swainson's hawk	*Buteo swainsoni*
Townsend's solitaire	*Myadestes townsendi*
tree swallow	*Tachycineta bicolor*
trumpeter swan	*Olor buccinator*
vesper sparrow	*Pooecetes gramineus*
violet-green swallow	*Tachycineta thalassina*
Virginia rail	*Rallus limicola*
water pipet	*Anthus spinoletta*
western flycatcher	*Empidonax difficilus*
western grebe	*Aechmophorus occidentalis*
western kingbird	*Tyrannus verticalis*
western meadowlark	*Sturnella neglecta*
western sandpiper	*Caldris mauri*
western tanager	*Piranga ludoviciana*
white-crowned sparrow	*Zonotrichia leucophrys*
white-tailed jackrabbit	*Lepus townsendii*
willet	*Catoptrophorus semipalmatus*
Wilson's phalarope	*Phalaropus tricolor*

Common Name	Species Name
Wilson's warbler	*Wilsonia pusilla*
wood duck	*Aix sponsa*
yellow rumped warbler	*Dendroica coronata*
yellow warbler	*Dendroica petechia*
yellow-breasted chat	*Iteria virens*
yellow-headed blackbird	*Xanthocephalus xanthocephalus*

Common Name	Species Name
Wilson's warbler	*Wilsonia pusilla*
wood duck	*Aix sponsa*
yellow rumped warbler	*Dendroica coronata*
yellow warbler	*Dendroica petechia*
yellow-breasted chat	*Iteria virens*
yellow-headed blackbird	*Xanthocephalus xanthocephalus*